FRAME GASKETS FOR EMI SHIELDING: HOW MOLDING REDUCES COSTS, INCREASES YIELDS, AND SUPPORTS LOW-VOLUME PRODUCTION

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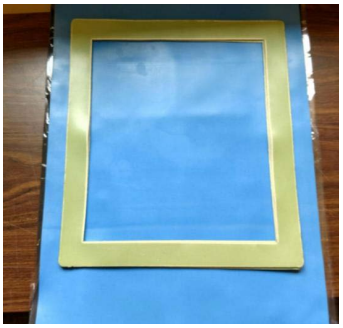


Conductive elastomers that are made of silicones and filled with metal particles provide environmental sealing, electrical conductivity, and resistance to electromagnetic interference (EMI). These sealing and shielding elastomers are great for EMI gaskets, but engineers need to select the right materials and use the most cost-effective fabrication method.

That's especially important because conductive elastomers are significantly more expensive than commodity rubber.

Specialty Silicone Products (SSP) of Ballston Spa, New York (USA) makes conductive elastomers that use silicone or fluorosilicone as the base material and contain nickel-coated graphite, nickel-coated aluminum, silver-aluminum, or silver-copper particles as the fill. SSP supplies these shielding silicones as sheets, rolls, ready-to-mold compounds, extruded profiles, and O-rings.

For frame gaskets, molding minimizes material waste, maximizes material yields, and reduces the risk that's associated with bonding cut lengths. Fabrication processes like die cutting are efficient, but the cut-out section of a frame gasket can represent significant material waste. To support our customers, SSP supplies mold-able EMI silicones and operates an in-house machine shop with CNC capabilities. By asking SSP to mold SpecShield™ elastomers into EMI frame gaskets, engineers are saving time and money.

Conductive Elastomers and Material Costs

Conductive elastomers that use silicone as the base material can withstand a wide range of temperatures. Some are also flame retardant. Conductive elastomers that contain fluorosilicone combine the advantages of silicone rubber with fuel and solvent resistance. To provide EMI shielding and electrical conductivity, SSP packs the base elastomer (a natural insulator) with metal or metal-coated particles.

During product design and development, engineers can specify conductive elastomers that use different fills. EMI silicones that contain silver-coated particles provide excellent shielding. Yet they also cost more than nickel-graphite compounds that have silver-like shielding effectiveness. SSP has proven the shielding effectiveness of its nickel-graphite silicones through third-party testing at an approved laboratory according to the MIL-DTL-83528 standard.

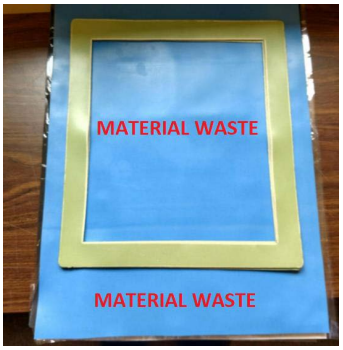
No matter which type of fill an engineer specifies, conductive elastomers cost more than commodity rubber. These costs aren't just a function of the large amounts of silver-coated or nickel-coated particles that are required. Conductive elastomers cost more because of how they're made. Compression molding for standard 10' x 20' or 15' x 20' sheets is a time-consuming, labor-intensive process.

Unfortunately, even companies that understand these costs may overlook them when gasket quantities are low. As production increases, however, the high costs of EMI gaskets can't be ignored. For example, an engineer who specifies a silver-filled conductive elastomer that's .125" thick may discover that a die cut, frame-style EMI gasket is now one of the most expensive parts of a housing or module.

For engineers and technical buyers who buy gaskets made of commodity rubber, these high costs aren't just alarming. Cost overruns on EMI gaskets can also jeopardize price-sensitive projects. That's why defense contractors, automotive tier suppliers, telecommunications companies, and other manufacturers are looking for ways to cut EMI gasket costs. With molded EMI frame gaskets, SSP has the solution.

Material Waste: Gasket Molding vs. Cutting and Bonding

Frame gaskets are usually rectangular since they protect a box-like housing or enclosure. In the image at left, the green part is the frame (the gasket) and the blue part is sheet.



As you can see, the area in the middle is empty. Die cutting a gasket like this is expensive if the material in the middle is discarded. There's also significant material waste along the top, bottom, and sides.

What does this mean in terms of material costs? Consider the following example.

Let's say that the blue sheet cost $400. A die cutter applied a markup and added labor so that the cost of the green gasket was $500. A customer then ordered 300 gaskets and paid $150,000 for them.

That's a significant expense even without material waste. If 60% of the sheet material is discarded, the cost of the waste is $90,000.

The gasket's width and length aren't the only measurements that matter here. EMI frame gaskets with a thickness of .062" or higher are leading candidates for cost savings. Volume might not be as important as you think either. SSP can mold EMI gaskets in quantities as low as 15 to 20. Because we have our own machine shop, we can control costs. With higher volumes, the per-gasket cost of tools becomes negligible.

Engineers who choose molded EMI frame gaskets like how SSP can mold an entire part instead of cutting and then bonding strips or extrusions. Using a single, molded part improves performance and reduces the risk of leaking that's associated with the corners of bonded gaskets. There are several ways to bond cut lengths of conductive elastomers, but cold bonding and RTVs have disadvantages.

Cold bonding is a low-cost method that uses a glue to join the corners of an EMI frame gasket. Glues won't withstand the same temperatures as the conductive elastomer and can break during installation, allowing environmental and EMI leakage. Room-temperature vulcanizing (RTV) silicones can withstand higher temperatures but usually aren't conductive. RTVs support vulcanization and hot splicing instead of cold bonding, but RTVs can provide paths that result in EMI leakage.

Conductive RTVs are available but may not provide a cost-effective solution. First, a gasket fabricator molds the sheets or extrudes the materials. The fabricator then cuts the sheets or extrusions to size before priming the corners. By the time the conductive RTV is applied to each corner, the gasket may be more expensive than if it had been molded.

Molded EMI Gaskets from SSP

SSP molds frame gaskets from conductive elastomers that provide environmental sealing, electrical conductivity, and EMI shielding. To minimize material waste, we mold your gaskets in a slightly large size. You can then trim the final gasket to meet your precise dimensional specifications.

Even with low volume quantities, molding is a cost-effective fabrication method for EMI frame gaskets. Molding also minimizes the risks associated with joining cut lengths produced by cutting and bonding processes.

To learn more about molded EMI frame gaskets, contact Specialty Silicone Products.